USER SATISFACTION ON VIRTUAL REALITY TAEKWONDO TRAINING MATERIAL

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Abstrak

Kajian ini memberi tumpuan kepada reka bentuk dan pembangunan prototaip Persekitaran Latihan Taekwondo Maya (VT^2E) sebagai bahan tambahan untuk latihan Taekwondo arah sendiri. Walaupun terdapat pelbagai bahan latihan Taekwondo tambahan yang ada, kebanyakannya mempunyai batasan dalam menyokong latihan arah sendiri. Hasil kajian awal menunjukkan pentingnya latihan Taekwondo yang diarahkan oleh para pelatih dan mereka menghadapi masalah semasa menjalani latihan arah sendiri di rumah kerana mereka tidak mempunyai bahan latihan tambahan yang sesuai untuk membimbing mereka. Oleh itu, penyelidikan ini bertujuan untuk membangun prototaip VT^2E sebagai bahan tambahan untuk latihan Taekwondo arah sendiri yang menggabungkan teknologi Realiti Maya (VR) dan Tangkapan Gerakan (MoCap) untuk menilai kepuasan para pelatih dari aspek penglibatan, kehadiran, kegunaan dan kemudahan penggunaan. Metodologi kajian ini terdiri daripada tiga fasa, iaitu; pengumpulan maklumat, reka bentuk prototaip dan pembangunan dan penilaian yang disesuaikan daripada Vaishnavi dan Kuechler (2008). Dalam menyediakan bahan pembelajaran yang berguna dan berkesan, prototaip menggabungkan Teori Konstruktivis dan Teori Aliran. Analisis persepsi, korelasi Pearson dan regresi digunakan untuk menentukan kesan penglibatan, kehadiran, kegunaan dan kemudahan penggunaan ke atas kepuasan pelatih dalam menggunakan prototaip VT^2E. Keputusan menunjukkan sokongan empirikal untuk hubungan positif dan statistik yang signifikan antara kegunaan dan kemudahan penggunaan terhadap kepuasan para pelatih. Bagaimanapun, penglibatan dan kehadiran tidak mempunyai hubungan yang positif dan signifikan dengan kepuasan. Sebagai kesimpulan, kajian ini telah melihat kemungkinan memperkenalkan pendekatan latihan baru melalui penggunaan kedua-dua teknologi tersebut. Adalah diharapkan prototaip ini dapat menjadi panduan untuk latihan Taekwondo dalam meningkatkan kemahiran dan persembahan dan secara tidak langsung memenuhi kepuasan para pelatih.

Kata kunci: Prototaip VT^2E, Realiti Maya (VR), Tangkapan Pergerakan (MoCap), latihan arah sendiri, latihan Taekwondo

Abstract

This study focuses on the design and development of Virtual Taekwondo Training Environment (VT^2E) prototype as a supplementary material for self-directed Taekwondo training. Even though there are varieties of supplementary Taekwondo training materials available, most of them have limitations in supporting self-directed training. The results of the preliminary study clearly indicated the importance of self-directed Taekwondo training among the trainees and they are facing problems while performing self-directed training at home since they do not have proper supplementary training materials to guide them. Thus, the research aims to propose the VT^2E prototype as a supplementary material for self-directed Taekwondo training which incorporates Virtual Reality (VR) and Motion Capture (MoCap) technologies which is to study the trainees' satisfaction in terms of Engaging, Presence, Usefulness and Ease of Use. The methodology of this study consists of three phases, namely; information gathering, prototype design and development and evaluation which is adapted from Vaishnavi and Kuechler (2008). In providing a useful and effective training material, the prototype incorporates the Constructivist Theory and Theory of Flow. Perception, Pearson Correlation and Regression analyses were used to determine the effects of Engaging, Presence, Usefulness and Ease of Use on trainees' Satisfaction in using the VT^2E prototype. The results provided empirical support for the positive and statistically significant relationships between usefulness and ease of use on trainees' satisfaction. However, Engaging and Presence did not have positive and significant relationships with satisfaction. As for the conclusion, this study has looked into the possibility of introducing a new approach of training through the use of the two technologies. It is hopeful that this prototype can be a guide for self-directed Taekwondo training in enhancing the skills and performances and indirectly fulfil the trainees' satisfaction.

Keywords: VT^2E prototype, Virtual Reality (VR), Motion Capture (MoCap), self-directed training, Taekwondo training

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List of Abbreviations

VR	Virtual Reality
MoCap	Motion Capture
WTF	World Taekwondo Federation
VE	Virtual Environments
3D	Three Dimensions
HMD	Head Mounted Display
SPSS	Statistical Package for the Social Sciences
QTM	Qualisys Track Manager

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter presents the background of the research focus. The introduction focuses on several specific topics which are important to the research which consists of background of the study, statement of the problems, research questions, research objectives, research scope, research hypotheses and research significance.

1.2 Background of Study

Martial arts are very well-known and have long existed more than 3000 years ago. It is categorized as exercise and sports that have hundreds of different styles (Lakes & Hoyt, 2004). Millions of people involved in martial arts recognize the importance of martial arts training for health. It continues to increase in participation, especially among youth (Woodward, 2009). According to WorldMAC Academy, the involvement of practitioners in martial arts was estimated 350 million in worldwide.

Each martial arts training have its unique benefits compared with other activities (Goldsmith, 2013). This has been proven by several studies. According to Lakes and Hoyt (2004), when involved in martial arts, among the benefits is that a person acquires more active thoughts and actions resulting in better actions. The martial arts training involve three important aspects that include discipline, body control, commitment and self-control (Goldsmith, 2013). In addition, martial arts are associated with health that can provide physical fitness among practitioners (Tsang, Kohn, Chow & Fiatarone Singh, 2010; Yoshimura & Imamura, 2010). Besides that, involvement in martial arts is also due to several factors that include; aesthetics,

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Appendix A

Preliminary Study Questionnaires

Pusat Pengajian Teknologi Multimedia Dan Komunikasi

Universiti Utara Malaysia

06010 UUM Sintok

Kedah Darul Aman

Tuan/Puan/Cik yang dihormati,

Kaji selidik ini dijalankan untuk mendapatkan maklumat berkaitan dengan pengalaman anda menjalani latihan seni mempertahankan diri taekwondo. Saya amat berbesar hati sekiranya Tuan/Puan/Cik dapat menjawab **SEMUA** soalan atau mengisi pada ruangan yang disediakan. Segala maklumat yang diberikan hanyalah untuk tujuan akademik.

Kerjasama anda amat dihargai.

BAHAGIAN A: MAKLUMAT UMUM

Jawab soalan berikut dengan menandakan (√) didalam kotak dan juga menulis jawapan diruang yang disediakan.

1. Jantina
   ☐ Lelaki ☐ Perempuan

2. Umur _____tahun

3. Tahap pendidikan

   ☐ Sekolah Rendah ☐ Kolej/Universiti
   ☐ Sekolah Menengah ☐ Lain-lain

BAHAGIAN B: MAKLUMAT BERKAITAN LATIHAN TAEKWONDO

Jawab soalan berikut dengan menandakan (√) didalam kotak yang disediakan.

No.	Soalan	Ya	Tidak
1.	Saya mengikuti latihan taekwondo secara beramai-ramai yang dikendalikan oleh jurulatih		
2.	Saya dapat melihat dengan jelas setiap langkah dan teknik dalam taekwondo yang ditunjuk oleh jurulatih semasa latihan beramai-ramai		
3.	Saya dapat mendengar dengan jelas setiap arahan berkaitan dengan langkah dan teknik daripada jurulatih semasa latihan beramai-ramai		
4.	Saya memahami setiap langkah dan teknik dalam latihan taekwondo secara beramai-ramai		
5.	Saya mengingati setiap langkah dan teknik yang di ajar oleh jurulatih dalam taekwondo semasa latihan beramai-ramai		
6.	Saya selesa dengan latihan yang dijalankan secara beramai-ramai		
7.	Saya dapat menumpukan perhatian dalam latihan secara beramai-ramai		
8.	Mempelajari taekwondo secara beramai-ramai mencukupi untuk saya mahir dalam taekwondo		
9.	Mempelajari taekwondo secara beramai-ramai mencukupi untuk saya bersedia untuk mengambil ujian		
10.	Secara keseluruhan saya berpuas hati mempelajari taekwondo secara beramai-ramai		

BAHAGIAN C: MAKLUMAT BERKAITAN LATIHAN TAEKWONDO SENDIRI

Jawab soalan berikut dengan menandakan (√) didalam kotak yang disediakan.

No.	Soalan	Ya	Tidak
1.	Saya melakukan latihan taekwondo sendiri di rumah		
2.	Saya berminat melakukan latihan taekwondo sendiri di rumah		
3.	Saya menghadapi masalah melakukan latihan taekwondo sendiri di rumah		
4.	Saya memerlukan bahan latihan taekwondo untuk membolehkan saya berlatih taekwando sendiri dirumah		
5.	Saya mengikuti latihan taekwondo melalui sumber lain.		
Jika jawapan bagi bahagian 5 ialah **Ya**, teruskan menjawab bahagian 6 dan 7.			
6.	Tandakan [√] pada kotak yang berkenaan dengan sumber lain yang dirujuk untuk latihan taekwondo sendiri. ☐ DVD/CD/Video ☐ Youtube ☐ Internet ☐ Buku ☐ Lain-lain (sila nyatakan)		
7.	Sekiranya alat bantuan latihan taekwondo sendiri yang interaktif di buat menggunakan teknologi realiti maya menggabungkan objek 3D dan animasi 3D, saya akan menggunakannya untuk latihan taekwondo sendiri.		

BAHAGIAN D: MAKLUMAT BERKAITAN MENDUDUKI UJIAN TAEKWONDO

Jawab soalan berikut dengan menandakan (√) didalam kotak yang disediakan.

No.	Soalan	Ya	Tidak
1.	Latihan secara beramai-ramai oleh jurulatih sudah mencukupi untuk persediaan bagi saya menduduki ujian taekwondo		
2.	Latihan dengan merujuk kepada alat bantuan latihan seperti DVD/CD/video, youtube, online, buku, dan lain-lain mencukupi untuk persediaan saya menduduki ujian taekwondo		
3.	Saya memerlukan latihan tambahan untuk persediaan saya menduduki ujian taekwondo		
4.	Saya yakin dengan menjalankan latihan taekwondo sendiri di rumah tanpa bantuan alat latihan boleh membantu saya lulus dalam ujian taekwondo		
5.	Saya memerlukan alat bantuan latihan yang interaktif untuk membolehkan saya berlatih taekwando sendiri dirumah bagi menduduki ujian taekwondo		
6.	Saya yakin alat bantuan latihan taekwondo yang interaktif di buat menggunakan teknologi animasi 3D dapat membantu saya bersedia untuk menduduki ujian taekwondo		

Kerjasama anda amatlah dihargai
Terima kasih

Appendix B

VT^{2}E Evaluation Questionnaire

UNIVERSITI UTARA MALAYSIA
KOLEJ SASTERA DAN SAINS
06010 UUM SINTOK KEDAH DARUL AMAN

Pelatih Taekwondo yang saya hormati,
Tujuan kaji selidik ini dijalankan untuk mendapatkan maklum balas dari pelatih-pelatih Taekwondo berkaitan dengan perspesi terhadap kaedah latihan melalui Persekitaran Latihan Taekwondo Maya (VT^{2}E) sebagai bahan tambahan dalam membantu melakukan latihan Taekwondo secara sendiri.

Saya amat berbesar hati sekiranya pelatih-pelatih dapat menjawab **SEMUA** soalan pada ruangan yang disediakan. Segala maklumat yang diberikan hanyalah untuk tujuan akademik semata-mata.

Kerjasama pelatih-pelatih amatlah dihargai.
Terima kasih.

Yang benar,
Nur Ain Binti Mohd Jelani (817161)
M. Sc. MM Studies (By Research)

Bahagian A: Maklumat Umum

Sila jawab soalan berikut dan tandakan [√] pada kotak yang disediakan.

1. Jantina

☐ Lelaki ☐ Perempuan

2. Umur (tahun)

☐ <12 ☐ 12 - 19 ☐ >19

3. Bangsa

☐ Melayu ☐ Cina ☐ India ☐ Lain-lain

Bahagian B: Penggunaan Komputer Dan Realiti Maya

Sila jawab soalan berikut dan tandakan [√] pada kotak yang disediakan.

1. Adakah anda mempunyai kemudahan komputer di rumah?

☐ Ya ☐ Tidak

2. Berapa kerap anda menggunakan komputer?

☐ Harian ☐ Mingguan ☐ Bulanan

3. Adakah anda mempunyai pengetahuan berkaitan Teknologi Realiti Maya?

☐ Ya ☐ Tidak

4. Adakah anda menggunakan bahan rujukan tambahan dalam menjalani latihan Taekwondo secara sendiri?

☐ Ya ☐ Tidak

5. Sila tandakan sumber lain yang **PERNAH** anda rujuk untuk latihan taekwondo secara sendiri.

☐ YouTube

☐ CD/DVD/Video

☐ Buku

☐ Lain-lain (sila nyatakan) ----------

Bahagian C: Penilaian Kepuasan Pengguna

Sila jawab kenyataan berikut dengan membulatkan diruang yang disediakan seperti yang ditunjukkan dibawah.

Skala:

Sangat Tidak Setuju	Tidak Setuju	Tidak Pasti	Setuju	Sangat Setuju
1	2	3	4	(5)

1. PENGLIBATAN / ENGAGING ***(Webster, Trevino & Ryan, 1993)***
Definisi: Tahap di mana seseorang merasai yang dia terlibat secara langsung di dalam suatu persekitaran (Bierbaum, Just, Hartling, Meinert, Baker & Cruz-Neira, 2001).

Bil	Kenyataan	Skala				
1	VT^2E membuatkan saya memberi tumpuan sepenuhnya dalam latihan Taekwondo secara sendiri.	1	2	3	4	5
2	VT^2E menarik perhatian saya.	1	2	3	4	5
3	VT^2E merangsang rasa ingin tahu saya.	1	2	3	4	5
4	VT^2E membangkitkan daya imaginasi saya.	1	2	3	4	5
5	VT^2E menyeronokkan.	1	2	3	4	5
6	VT^2E menarik secara intrinsik.	1	2	3	4	5

2. HADIR / PRESENCE ***(Kalawsky, 1999)***
Definisi: Pengalaman subjektif berada di satu tempat atau persekitaran, walaupun secara fizikal seseorang itu berada di tempat yang lain (Witmer & Singer, 1998).

Bil	Kenyataan	Skala				
1	Saya rasa hadir (iaitu berada di sana) apabila menggunakan VT^2E.	1	2	3	4	5
2	Kualiti imej dalam VT^2E meningkatkan perasaan hadir.	1	2	3	4	5

3	Saya berpendapat bahawa ruang pandangan dalam VT^{2}E dapat meningkatkan rasa hadir.	1	2	3	4	5
4	Saya merasakan berada di sana dan sebahagian daripada persekitaran maya.	1	2	3	4	5
5	Saya dapat menghayati skala dengan baik di dalam persekitaran maya.	1	2	3	4	5
6	Saya sering tahu di mana saya berada di dalam persekitaran maya.	1	2	3	4	5

3. KEBERGUNAAN / USEFULNESS ***(Davis, 1993)***
Definisi: Tahap di mana seseorang itu percaya dengan sesuatu sistem tertentu dapat meningkatkan prestasi kerjanya (Davis, 1993).

Bil	**Kenyataan**	**Skala**				
1	Menggunakan VT^{2}E dalam latihan membolehkan saya menyelesaikan latihan dengan lebih cepat.	1	2	3	4	5
2	Menggunakan VT^{2}E dapat memperbaiki prestasi latihan saya.	1	2	3	4	5
3	Menggunakan VT^{2}E dalam latihan dapat meningkatkan produktiviti saya.	1	2	3	4	5
4	Menggunakan VT^{2}E dapat meningkatkan keberkesanan latihan saya.	1	2	3	4	5
5	Menggunakan VT^{2}E dapat memudahkan latihan saya.	1	2	3	4	5
6	Saya dapati VT^{2}E berguna dalam latihan saya.	1	2	3	4	5

4. KEMUDAHGUNAAN / EASE OF USE (*Davis, 1989)*
Definisi: Tahap di mana seseorang itu percaya dengan menggunakan sesuatu sistem tertentu akan bebas daripada usaha (Davis, 1989).

Bil	**Kenyataan**	**Skala**				
1	Belajar untuk mengendalikan VT^{2}E adalah mudah bagi saya.	1	2	3	4	5
2	Saya dapati VT^{2}E mudah untuk melakukan apa yang saya mahu ia lakukan.	1	2	3	4	5
3	Interaksi saya dengan VT^{2}E adalah jelas dan mudah difahami.	1	2	3	4	5
4	Saya dapati VT^{2}E fleksibel untuk berinteraksi.	1	2	3	4	5
5	Adalah mudah bagi saya untuk mahir menggunakan VT^{2}E.	1	2	3	4	5
6	Saya dapati VT^{2}E mudah digunakan.	1	2	3	4	5

6. KEPUASAN HATI / SATISFACTION ***(Chou & Liu, 2005)***
Definisi: Tahap di mana seseorang itu percaya bahawa pemilikan dan/ atau menggunakan suatu perkhidmatan dapat menimbulkan perasaan positif

(Rust & Oliver, 1994).						
Bil	**Kenyataan**	**Skala**				
1	Saya berpuas hati dengan pengalaman latihan menggunakan VT^2E.	1	2	3	4	5
2	Saya berpuas hati dengan keberkesanan latihan keseluruhannya.	1	2	3	4	5
3	Saya berpuas hati dengan kaedah latihan menggunakan persekitaran latihan berasaskan komputer.	1	2	3	4	5
4	Saya berpuas hati dengan jenis persekitaran latihan berasaskan komputer.	1	2	3	4	5
5	Saya mendapati kandungan VT^2E memenuhi keperluan saya dalam latihan Taekwondo.	1	2	3	4	5

Appendix C

Expert Review 1

EVALUATION BY INTERFACE EXPERT

I, hereby certify that the **Virtual Taekwondo Training Environment (VT^2E): A Self-Directed Taekwondo Training Prototype** has been produced by Nur Ain Binti Mohd Jelani (817161), student of Master of Science (Multimedia Studies), by Research, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked in terms of the validity of the contents and the general comments are as follows:

General Comments:

Presented in static format of the website (offline)

1. Looking at the button, it would be helpful to have video or animated characters to investigate the position or steps made by the trainer.
2. Layout is nicely positioned.
3. Icons for button need to have tooltip to inform users ~~#~~ their functions. Otherwise, design icon which is familiar to the user.

Name: Juliana Arda Abu Bakar

Position: Lecturer

Address: SUMPA

Date: 14.10.2018

Appendix D

Expert Review 2

EVALUATION BY INTERFACE EXPERT

I, hereby certify that the **Virtual Taekwondo Training Environment (VT^2E): A Self-Directed Taekwondo Training Prototype** has been produced by Nur Ain Binti Mohd Jelani (817161), student of Master of Science (Multimedia Studies), by Research, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked in terms of the validity of the contents and the general comments are as follows:

General Comments:

Layout : Jelas menggambarkan tujuan aplikasi di bangunkan

Warna : Warna cerah yang digunakan adalah sesuai

Butang : Butang berada pada kedudukan yang ~~sincronize~~ tetap yang memudahkan pengguna

Font : Font yang digunakan untuk memberi maklumat adalah kecil. Mungkin sizenya boleh di besarkan sedikit.

Name: Yussalita Md Yussop

Position: Pensyarah

Address: SMMTC

Date: 14/10/18

Appendix E

Expert Review 3

EVALUATION BY CONTENT EXPERT

I, hereby certify that the **Virtual Taekwondo Training Environment (VT^2E): A Self-Directed Taekwondo Training Prototype** has been produced by Nur Ain Binti Mohd Jelani (817161), student of Master of Science (Multimedia Studies), by Research, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked in terms of the validity of the contents and the general comments are as follows:

General Comments:

i) Isi kandungan dalam prototaip ini telah disemak dan sesuai untuk kegunaan pelatih-pelatih Taekwondo.

ii) Isi kandungan juga mudah di fahami

iii) Penggunaan prototaip ini dapat membantu pelatih-pelatih Taekwondo terutamanya dalam menjalani latihan secara kendiri

Name: Jufrifly Bin Nawang

Position: Jurulatih Taekwondo WTF

Address: Kota Bharu, Kelantan

Date: 9/5/2017

Appendix F

Expert Review 4

EVALUATION BY CONTENT EXPERT

I, hereby certify that the **Virtual Taekwondo Training Environment (VT^2E): A Self-Directed Taekwondo Training Prototype** has been produced by Nur Ain Binti Mohd Jelani (817161), student of Master of Science (Multimedia Studies), by Research, College of Arts and Sciences, Universiti Utara Malaysia. It has been checked in terms of the validity of the contents and the general comments are as follows:

General Comments:

1) Isi kandungan bersesuaian dengan silibus Taekwondo WTF dan sangat berguna dalam membantu pelatih-pelatih terutamanya dalam menjalankan latihan secara kendiri
2) Harap prototaip ini dapat dikembangkan lagi dalam seni mempertahankan diri yang lain.

Name: Nur Fitrah Hani Binti Kashfi
Position: Jurulatih Taekwondo Pusat Kokurikulum UUM
Address: Pusat Kokurikulum UUM, Sintok

Date: 9/5/2017

Appendix G

Expert Profile

Dr. Juliana Aida Abu Bakar is a senior lecturer at the Multimedia Technology and Communication, Universiti Utara Malaysia (SMMTC). Her research areas comprise Virtual Environment Technology, Augmented Reality and Learning and Multimedia Learning Environment.

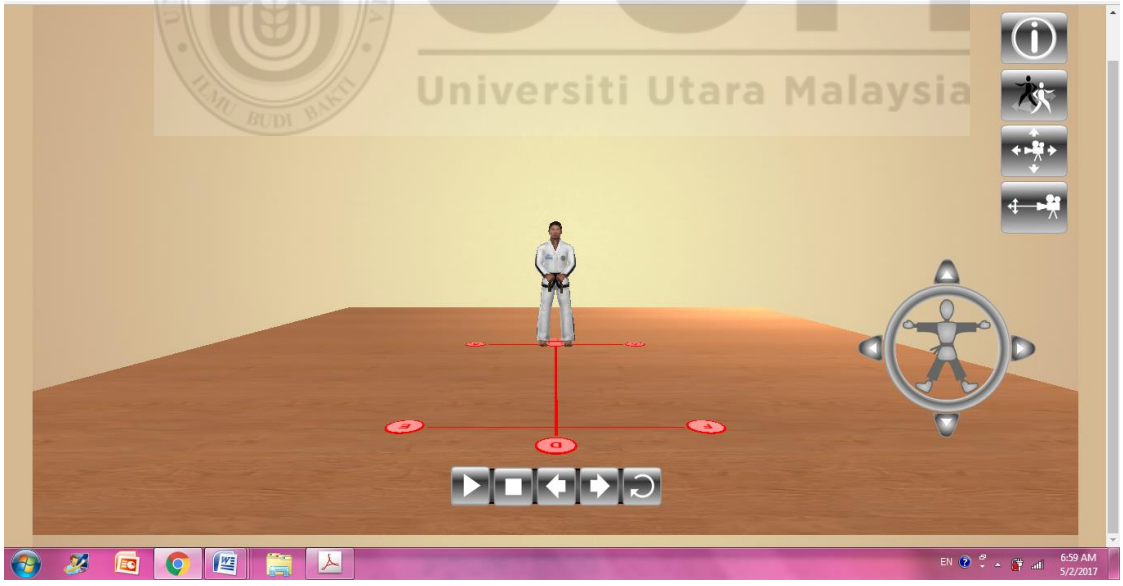
Yussalita Md Yussop is a senior lecturer at the Multimedia Technology and Communication, Universiti Utara Malaysia (SMMTC). Her research areas comprise Virtual Environment Technology, Augmented Reality and Learning and Multimedia Learning Environment.

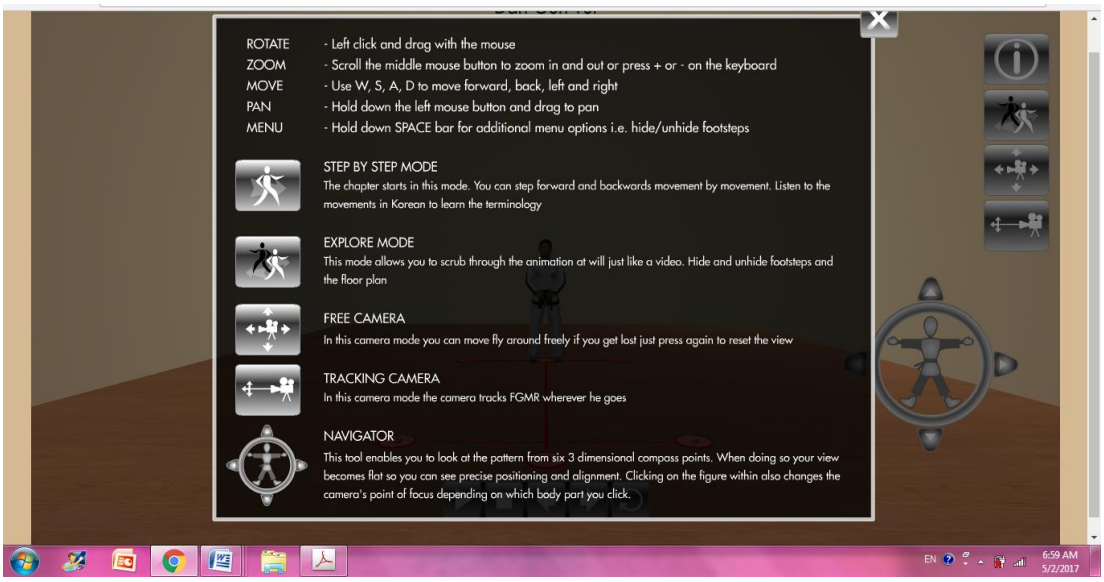
Zulkifly Bin Nawang is a senior WTF Taekwondo trainer at the Kota Bharu training club. He has experiences in teaching WTF Taekwondo training for more than five years.

Nur Fitriah Hani Binti Kashfi is a senior WTF Taekwondo trainer at the Pusat Kokurikulum UUM. She has experiences in teaching WTF Taekwondo training for more than five years.

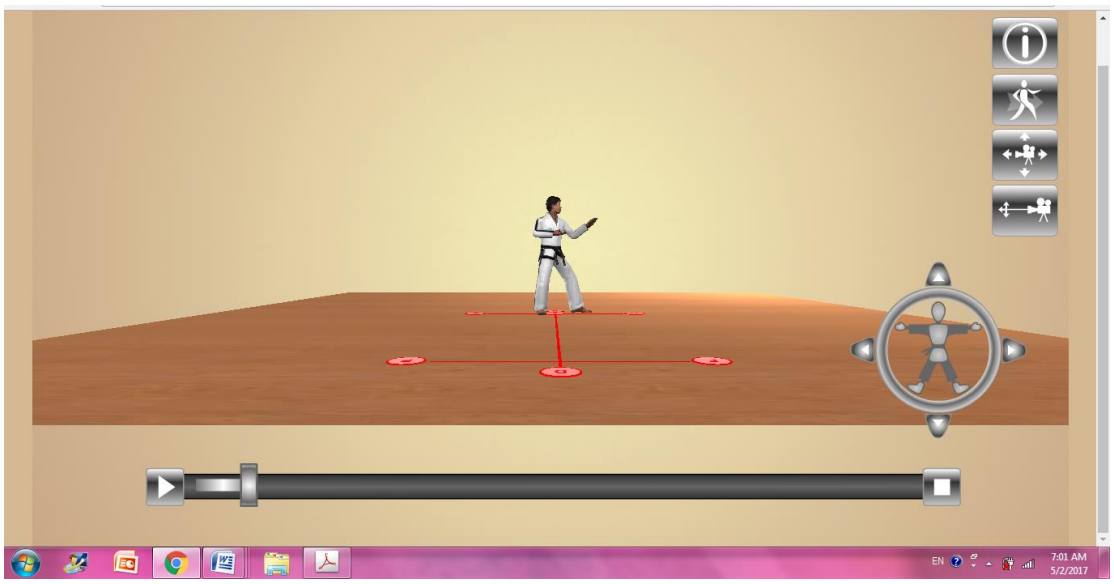
Appendix H

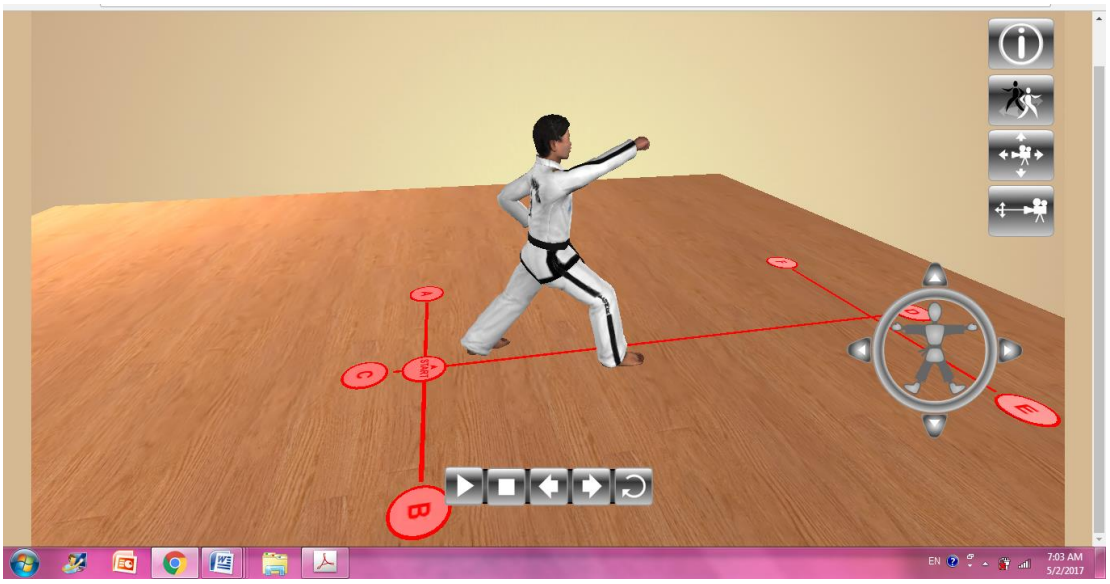
Snapshots of VT^{2}E Prototype

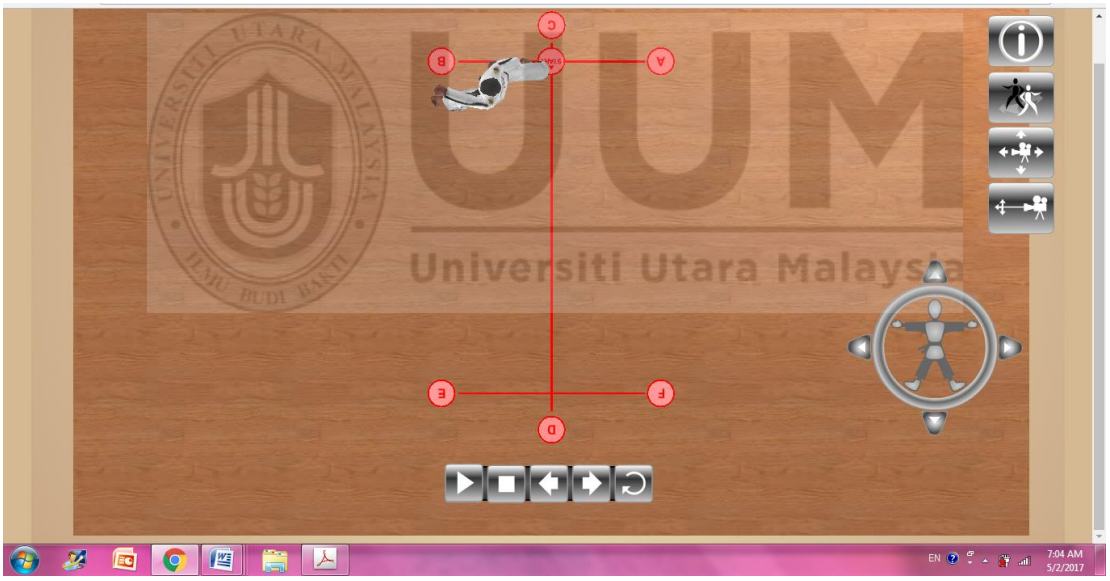



ROTATE - Left click and drag with the mouse
ZOOM - Scroll the middle mouse button to zoom in and out or press + or - on the keyboard
MOVE - Use W, S, A, D to move forward, back, left and right
PAN - Hold down the left mouse button and drag to pan
MENU - Hold down SPACE bar for additional menu options i.e. hide/unhide footsteps
STEP BY STEP MODE
The chapter starts in this mode. You can step forward and backwards movement by movement. Listen to the movements in Korean to learn the terminology
EXPLORE MODE
This mode allows you to scrub through the animation at will just like a video. Hide and unhide footsteps and the floor plan
FREE CAMERA
In this camera mode you can move fly around freely if you get lost just press again to reset the view
TRACKING CAMERA
In this camera mode the camera tracks FGMR wherever he goes
NAVIGATOR
This tool enables you to look at the pattern from six 3 dimensional compass points. When doing so your view becomes flat so you can see precise positioning and alignment. Clicking on the figure within also changes the camera's point of focus depending on which body part you click.
6:59 AM
5/2/2017


Universiti Utara Malaysia
7:00 AM
5/2/2017







Appendix I

Snapshots of User Evaluation